


```
000000  TTTTTTTTTT  SSSSSSSS  PPPPPPPP  000000  WW  WW  CCCCCCCC  DDDDDDDD  CCCCCCCC
000000  TTTTTTTTTT  SSSSSSSS  PPPPPPPP  000000  WW  WW  CCCCCCCC  DDDDDDDD  CCCCCCCC
00  00  TT  SS  PP  PP  00  00  WW  WW  CC  DD  DD  CC
00  00  TT  SS  PP  PP  00  00  WW  WW  CC  DD  DD  CC
00  00  TT  SS  PP  PP  00  00  WW  WW  CC  DD  DD  CC
00  00  TT  SS  PP  PP  00  00  WW  WW  CC  DD  DD  CC
00  00  TT  SS  PP  PP  00  00  WW  WW  CC  DD  DD  CC
00  00  TT  SS  PP  PP  00  00  WW  WW  CC  DD  DD  CC
00  00  TT  SS  PP  PP  00  00  WW  WW  CC  DD  DD  CC
00  00  TT  SS  PP  PP  00  00  WWW  WWW  CC  DD  DD  CC
00  00  TT  SS  PP  PP  00  00  WWW  WWW  CC  DD  DD  CC
000000  000000  000000  WW  WW  CCCCCCCC  DDDDDDDD  CCCCCCCC
000000  000000  000000  WW  WW  CCCCCCCC  DDDDDDDD  CCCCCCCC
...
...
...
...

LL  IIIIIII  SSSSSSSS
LL  IIIIIII  SSSSSSSS
LL  II  SS
LL  II  SS
LL  II  SS
LL  II  SS
LL  II  SSSSSS
LL  II  SSSSSS
LL  II  SS
LL  II  SS
LL  II  SS
LL  II  SS
LLLLLLLLLLLL  IIIIIII  SSSSSSSS
LLLLLLLLLLLL  IIIIIII  SSSSSSSS
```

(2) 46
(3) 78

DECLARATIONS
OTSS\$POWCDCD_R3 - D COMPLEX*16 ** D COMPLEX*16

```
0000 1 .TITLE OTSSPOWCDCD - D COMPLEX*16 ** D COMPLEX*16 routine
0000 2 .IDENT /1-002/ ; File: OTSPOWCDC.MAR Edit: SBL1002
0000 3
0000 4
0000 5 *****
0000 6
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0000 24
0000 25 *****
0000 26
0000 27
0000 28
0000 29 ++
0000 30 : FACILITY: Language support library - user callable
0000 31
0000 32 : ABSTRACT:
0000 33
0000 34 : D COMPLEX*16 base to D COMPLEX*16 power giving D COMPLEX*16 result.
0000 35
0000 36 : ENVIRONMENT: User Mode, AST Reentrant
0000 37
0000 38 --
0000 39 : AUTHOR: Steven B. Lionel, CREATION DATE: 20-July-1979
0000 40
0000 41 : MODIFIED BY:
0000 42
0000 43 : 1-001 - Original. Adapted from OTSSPOWCC version 1-003. SBL 20-Jul-1979
0000 44 : 1-002 - Use general mode addressing. SBL 30-Nov-1981
```



```

0000 46      .SBTTL  DECLARATIONS
0000 47      :
0000 48      : INCLUDE FILES:
0000 49      :
0000 50      :
0000 51      :
0000 52      : EXTERNAL DECLARATIONS:
0000 53      :
0000 54      : .DSABL  GBL
0000 55      : .EXTRN  MTH$CDEXP      ; Complex exponentiation
0000 56      : .EXTRN  MTH$CDLOG     ; Complex logarithm
0000 57      : .EXTRN  OTSSMULCD_R3  ; Complex multiplication
0000 58      :
0000 59      : MACROS:
0000 60      :
0000 61      :
0000 62      :
0000 63      : EQUATED SYMBOLS:
0000 64      :
00000004 0000 65      : base = 4      ; base input - by value
00000014 0000 66      : exp = 20     ; exponent input - by value
0000 67      :
0000 68      : OWN STORAGE:
0000 69      :
0000 70      :
0000 71      :
0000 72      : PSECT DECLARATIONS:
0000 73      :
00000000 0000 74      : .PSECT _OTSS$CODE PIC, USR, CON, REL, LCL, SHR, -
0000 75      : EXE, RD, NOWRT, LONG
0000 76

```

```

0000 78 .SBTTL OTSS$POWCDCD_R3 - D COMPLEX*16 ** D COMPLEX*16
0000 79 : **
0000 80 : FUNCTIONAL DESCRIPTION:
0000 81 :
0000 82 : OTSS$POWCDCD_R3 evaluates the result of taking a complex base
0000 83 : to a complex power. The ANS FORTRAN X3.9-1978 standard defines
0000 84 : complex exponentiation as:
0000 85 :
0000 86 :  $x ** y = \text{CEXP}(y * \text{CLOG}(x))$ 
0000 87 :
0000 88 : where x and y are type D COMPLEX*16.
0000 89 :
0000 90 : The arguments of OTSS$POWCDCD_R3 are CALL BY VALUE.
0000 91 :
0000 92 : CALLING SEQUENCE:
0000 93 :
0000 94 : power.wdc.v = OTSS$POWCDCD_R3 (base.rdc.v, exponent.rdc.v)
0000 95 :
0000 96 : INPUT PARAMETERS:
0000 97 :
0000 98 : Both base and exponent are D COMPLEX*16 numbers, each consisting
0000 99 : of a D REAL*8 real part and a D REAL*8 imaginary part. Both are
0000 100 : CALL BY VALUE.
0000 101 :
0000 102 : IMPLICIT INPUTS:
0000 103 :
0000 104 : NONE
0000 105 :
0000 106 : OUTPUT PARAMETERS:
0000 107 :
0000 108 : NONE
0000 109 :
0000 110 : IMPLICIT OUTPUTS:
0000 111 :
0000 112 : NONE
0000 113 :
0000 114 : FUNCTION VALUE:
0000 115 :
0000 116 : The D COMPLEX*16 (REAL*8, REAL*8) result of taking the
0000 117 : COMPLEX base to the COMPLEX exponent power is returned
0000 118 : in registers R0-R3. This is a violation of the VAX
0000 119 : calling standard, but is excused for compiled code
0000 120 : support routines.
0000 121 :
0000 122 : SIDE EFFECTS:
0000 123 :
0000 124 : Modifies registers R0-R3.
0000 125 :
0000 126 : Possible error signals are:
0000 127 :
0000 128 : MTH$_INVARGMAT if base is (0.,0.).
0000 129 : MTH$_FLOOVEMAT if floating overflow occurs.
0000 130 : MTH$_SINCOSSIG if absolute value of the imaginary part of
0000 131 : (exponent * CLOG(base)) > PI*2**30.
0000 132 : SS$_ROPRAND if reserved floating operand is fetched.
0000 133 :--

```

0000	0000	135	.ENTRY OTSSPOWCDCD_R3, ^M<>	; disable integer ovflo
	0002	136		
	0002	137	MTH\$FLAG_JACKET	; establish math error handler
6D	00000000'GF	9E	MOVAB G^MTH\$\$JACKET_HND, (FP)	; set handler address to jacket
	0009			; handler
	0009			
	0009	138		
	0009	139		
	0009	140		
	0009	141	Get complex logarithm of base	
	0009	142	SUBL2 #16, SP	; return complex on stack
5E	10	C2	PUSHAL base(AP)	; address of base
04	AC	DF	PUSHAB 4(SP)	; address of result
04	AE	9F	CALLS #2, G^MTH\$CDLOG	; (SP) gets LOG(base)
00000000'GF	02	FB		
	0012	145		
	0019	146		
	0019	147		
	0019	148	CLOG(base) is at (SP). Multiply by exponent.	
	0019	149	Do multiplication out of line.	
	0019	150		
7E	1C	AC	MOVQ exp+8(AP), -(SP)	; Put exponent on stack
7E	14	AC	MOVQ exp(AP), -(SP)	; CLOG(base) is already there!
00000000'GF	08	FB	CALLS #8, G^OTSS\$MULCD_R3	; R0-R3 gets CLOG(base) * exp
	0021	153		
	0028	154		
	0028	155		
	0028	156	Now compute CEXP(product)	
	0028	157		
	0028	158		
7E	52	7D	MOVQ R2, -(SP)	; put product on stack
7E	50	7D	MOVQ R0, -(SP)	
5E	10	C2	SUBL2 #16, SP	; Make room for result
10	AE	9F	PUSHAB 16(SP)	; Address of product
04	AE	9F	PUSHAB 4(SP)	; Address of result
00000000'GF	02	FB	CALLS #2, G^MTH\$CDEXP	; Result is at (SP)
50	8E	7D	MOVQ (SP)+, R0	; Pop result into R0-R3
52	8E	7D	MOVQ (SP)+, R2	
	0041	166		
	0044	167		
	04	0044	RET	; all done, exit
	0045	169	.END	

BASE = 00000004
EXP = 00000014
MTH\$JACKET_HND ***** X 01
MTH\$CDEXP ***** X 00
MTH\$CDLOG ***** X 00
OTSSMULCD_R3 ***** X 00
OTSPOWCDCD_R3 00000000 RG 01

! Psect synopsis !

PSECT name	Allocation	PSECT No.	Attributes														
ABS	00000000 (0.)	00 (0.)	NOPIC	USR	CON	ABS	LCL	NOSHR	NOEXE	NORD	NOWRT	NOVEC	BYTE				
OTSSCODE	00000045 (69.)	01 (1.)	PIC	USR	CON	REL	LCL	SHR	EXE	RD	NOWRT	NOVEC	LONG				

! Performance indicators !

Phase	Page faults	CPU Time	Elapsed Time
Initialization	30	00:00:00.10	00:00:00.78
Command processing	112	00:00:00.73	00:00:03.32
Pass 1	79	00:00:00.59	00:00:02.95
Symbol table sort	0	00:00:00.00	00:00:00.01
Pass 2	44	00:00:00.48	00:00:02.02
Symbol table output	2	00:00:00.01	00:00:00.01
Psect synopsis output	3	00:00:00.03	00:00:00.05
Cross-reference output	0	00:00:00.00	00:00:00.00
Assembler run totals	272	00:00:01.96	00:00:09.15

The working set limit was 750 pages.
2559 bytes (5 pages) of virtual memory were used to buffer the intermediate code.
There were 10 pages of symbol table space allocated to hold 7 non-local and 0 local symbols.
229 source lines were read in Pass 1, producing 11 object records in Pass 2.
1 page of virtual memory was used to define 1 macro.

! Macro library statistics !

Macro library name	Macros defined
-----	-----
_\$255\$DUA28:[SYSLIB]STARLET.MLB;2	0

0 GETS were required to define 0 macros.

There were no errors, warnings or information messages.

MACRO/ENABLE=SUPPRESSION/DISABLE=(GLOBAL,TRACEBACK)/LIS=LIS\$:OTSPOWCDC/OBJ=OBJ\$:OTSPOWCDC MSRC\$:MTHJACKET/UPDATE=(ENH\$:MTHJACKET)+MS

0264 AH-BT13A-SE
VAX/VMS V4.0

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